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Citation for published version:

Mnwana, S & Bowman, A 2018, 'Mine mechanisation and distributional conflict in rural South Africa', *Resources Policy*, vol. 59, pp. 227-237. <https://doi.org/10.1016/j.resourpol.2018.07.008>

Digital Object Identifier (DOI):

[10.1016/j.resourpol.2018.07.008](https://doi.org/10.1016/j.resourpol.2018.07.008)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

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Mine-community relations, labour conflict and redistributive policy: the socio-political dynamics of mine mechanisation in South Africa

1: Introduction

This paper examines the causes of trends towards increased mechanisation in South African platinum-group metals (PGM) mining, and its socio-political consequences. Following recent declines in many commodity prices, mining globally has intensified its focus on cost-control and productivity, generating impetus towards increased mechanisation and automation (McKinsey 2017; EY 2016, 12-13; PWC 2016, 30). This pressure is particularly acute in South African PGM mining. For historical reasons outlined in the paper, the sector developed around a highly labour-intensive business model similar to South Africa's historically dominant but declining gold sector. The apartheid-era institutional framework enabled white-owned mining companies to control wages, secure highly consolidated ownership of mineral property rights, and enclave their operations from adjacent communities. After the transition to democracy in 1994, PGM mining experienced rapid growth, eclipsing gold as the largest mining sub-sector with over 200,000 workers at a 2008 peak, and accounting for three-quarters of global platinum supply.¹ However, this growth was path-dependent on its labour-intensive business model, which as the paper demonstrates has become increasingly unprofitable and incompatible with the changed institutional context of the post-apartheid period.

¹ Source: Johnson Matthey Data, Platinum Supply and Demand by Region.

The South African mining industry has been declining as a proportion of economic activity since the early 1980s, shrinking from 14% of GDP in 1994 to 7% in 2016.² Nonetheless, it remains economically important due to its large multipliers and contribution to export revenues. Mining has also remained potentially symbolic as an embodiment of the multiple racialised inequalities of the apartheid system. Various post-1994 legislative reforms have sought to address these inequalities, and the industry has been a nexus of continuous, intense distributional contestation between government, new black business elites, mining communities, organised labour, and increasingly internationalised mining companies. This contestation has been particularly intense in PGM mining over recent years. With rising labour costs, decreasing productivity and falling prices, around half of operating PGM mines are estimated to be unprofitable (Bowman 2016; Baxter 2016). This is accompanied by multiple social problems relating to the migrant labour system and poor living conditions in informal settlements which have grown in mining areas. Labour conflict has been severe and destabilising. Most notably, the strike wave of 2012 culminated with the Marikana massacre in which South African police shot dead 34 striking mineworkers, and the five-month strike of 2014 which was the longest in South African history (Chinguno 2015; Mnwana 2015; Sinwell 2015).

The mining industry, and gold and PGM mining companies in particular, now see increased mechanisation as crucial to securing financial sustainability (Chamber of Mines 2017). As Chris Griffiths, Chief Executive of Anglo-American Platinum (Amplats), the world's largest platinum producer, stated recently, '[w]ith industry margins being squeezed on all fronts, we simply have to embrace innovation ... that involves moving away from the past conventional labour-intensive underground mining' (Anglo American 2015, 5). As the paper shows,

² StatsSA, Publication Series P0441 - Gross Domestic Product (GDP).

alongside this financial rationale are important socio-political rationales. Increased mechanisation is expected to offer a path away from the sector's turbulent labour relations and notoriously poor working and living conditions, and thereby not only restore its profitability but enhance its socio-political legitimacy. However, as the paper argues, the shift to mechanisation may solve one set of problems but create another. Notably, the 'social thinning' (Ferguson, 2006) created by mechanisation means the socio-environmental externalities accompanying mining may not be compensated for by mass employment opportunities, which creates new potential forms of tensions with communities and the state given the context of high unemployment and high expectations of the mining industry's developmental contribution.

In developing this argument, the paper analyses the key causes and consequences of the advancing spatial and technological reconfiguration of PGM mining. It focuses on issues of equity in value distribution, socio-ecological impacts and risks created by different mining business models, and the expectations of different stakeholders regarding the developmental contribution of mining (see Bebbington et al 2008; Kemp et al 2011). In doing so, it firstly contributes to literature on community conflict and development in the mining industry (e.g. Bebbington et al 2008; Bebbington 2012; Franks et al 2014; Le Billon 2012; Kemp et al 2011; Kemp & Owen 2013; Thorp et al 2012; Gilberthorpe & Banks 2012). Within this literature, the paper argues, there has been relatively little attention to how the specificities of mining practice and extraction models interact with developmental outcomes. With mechanisation and automation an accelerating trend in throughout other parts of the mining industry in South Africa and globally, there is a need to address this. Secondly, in improving understanding of evolving corporate strategies in the increasingly complex, fractious and politically disputed terrain of South African mining, the paper has broader relevance for

understanding the changing dynamics of state-business relations and distributional contestation in post-apartheid South Africa.

After discussing research methods, data sources, and pertinent secondary literature, the article analyses in detail the co-evolution of South African government policy on the developmental contribution of mining and corporate strategy among the major PGM mining companies, in particular the world's largest producer, Amplats. This explains the erosion of the financial and socio-political sustainability of the conventional labour-intensive PGM mining business model, and the drive towards a mechanised alternative.³ The third section provides case-study empirical material from ethnographic field research and analysis of company accounts to explore the differing impacts of labour-intensive and highly-mechanised mining. The paper concludes with reflections on the impact of increased mechanisation on mine-community relations and distributional contest in South Africa.

2: Research methods and data sources

The paper utilises a combination of data sources and research methods. Data on mine-community relations and community conflict dynamics is derived from extensive ethnographic fieldwork carried out in the major PGM mining districts of South Africa's North West and Limpopo provinces, on the Bushveld Complex's⁴ western and northern limbs (Figure 1).

³ It is important to stress that mechanised and labour-intensive mining in PGMs are not a simple binary. The latter uses mechanical loaders, scrapers and haulage to varying degrees. However, it is the removal of human labour from drilling and loading processes in conventional stoping methods that has proven difficult to achieve (Stewart 2015).

⁴ The geological formation estimated to contain 80% of the world's platinum deposits (Cawthorn 2010, 205).

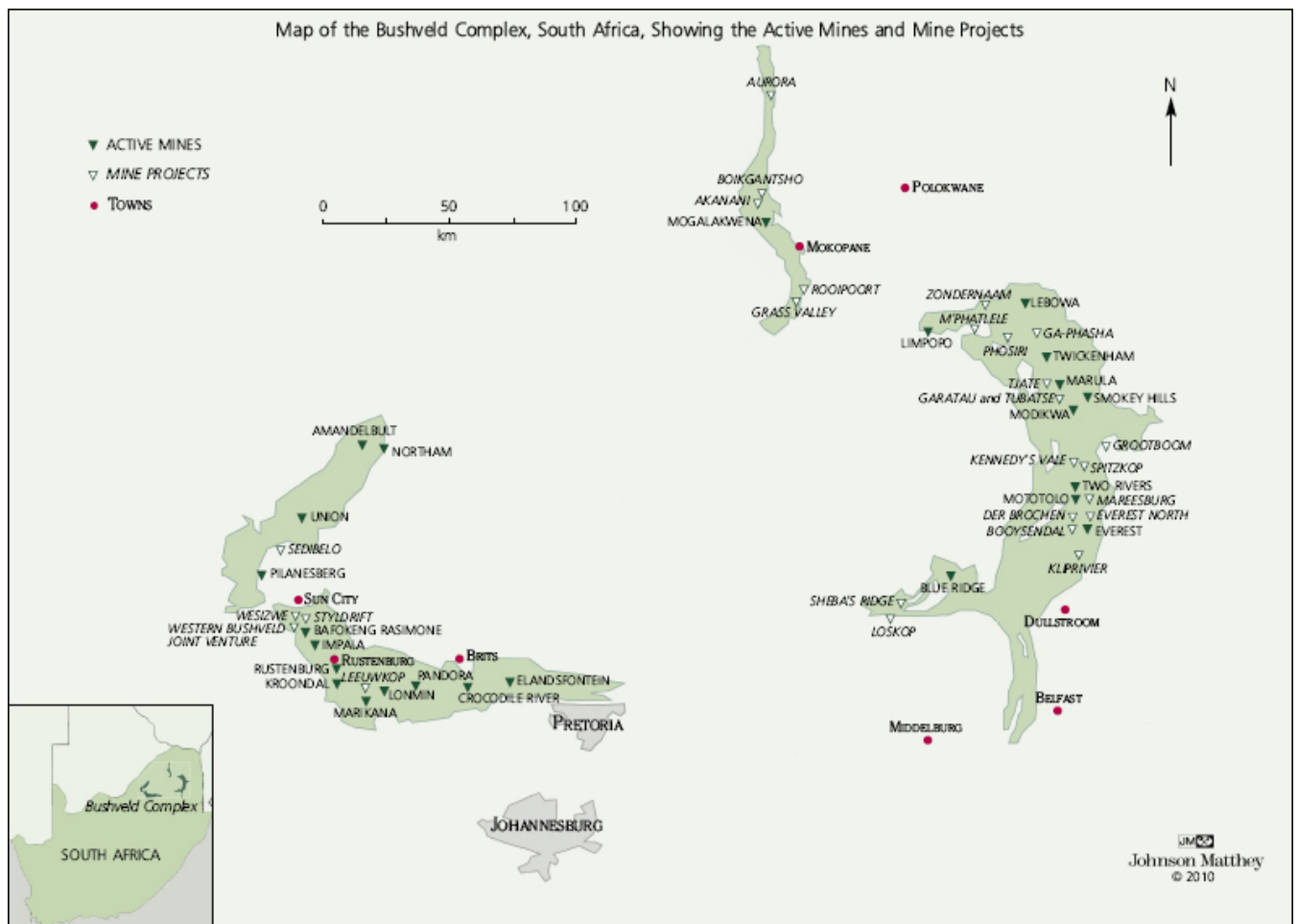


Figure 1: Map of the Bushveld Complex, South Africa

Source: Reproduced with the permission of Johnson Matthey. Originally in Cawthorn (2010).

This research, which began in 2008, has investigated the multiple impacts of PGM mining in several rural communities, and involved multiple extended stays in affected villages. It has involved comparison of community relations between different tribal authority areas (as discussed further below, tribal authorities are pivotal mediators of mine-community relations in South Africa) and different mining models. This article employs case-study material from Amplats' Union mine (sold in 2017 to Siyanda Resources) and Mogalakwena mine. The former is one of the oldest platinum mining operations in South Africa, and an archetype of the conventional labour intensive operating model. It is located on the border between

Limpopo and North West province, 25km north of the Pilanesberg National Park, in a predominantly rural area under the control of the Bakgatla-ba-Kgafela tribal authority. The latter mine, in contrast, uses highly capital-intensive, open-cast mining methods. It is situated in rural Limpopo Province, 30km north of Mokopane, in the Mapela tribal authority area. The comparative research conducted in these communities drew on different qualitative research methods. This included unstructured ethnographic observations and in-depth semi-structured interviews with a wide range of community members. More than 300 in-depth interviews have been carried out since 2008, with informants including traditional leaders, leaders of community-based-organisations and local government and mine officials.

The authors' used a combination of qualitative document analysis, semi-structured interviews and descriptive statistics to analyse the co-evolution of corporate strategy and government policy. The document analysis utilised relevant grey literature including government policy documents, reviews carried out by the Department of Mineral Resources (DMR), and publicly available company documents including annual reports and investor presentations. This was triangulated with relevant secondary literature, including material from academics and civil society organisations, business media coverage of the sector. Interviews with key informants selected by purposive sampling, primarily current and former senior managers from the industry, have been used to deepen the understanding of corporate strategy, but are not quoted here to preserve anonymity. Finally, in order to analyse the differing financial characteristics of labour-intensive and more mechanised PGM mining, and trends in productivity, the authors compiled time-series financial data from company annual reports and official statistics from the DMR. The authors used descriptive statistics and accounting ratios to analyse this quantitative data.

3: Literature review

The point-source nature of industrial mining elicits inevitable social tensions, particularly in developing-country contexts. Localised concentrations of negative externalities frequently combine with extreme wealth disparities between technologically-advanced, multinational extractive industry operations and impoverished host communities, creating extreme forms of uneven geographical development (Thorp et al 2012; Bebbington et al 2008; Bridge 2004). The extractive industry's expansion into new regions of the Global South during the 2000s commodity boom resulted in a range of new protest movements mobilising around these tensions (Bebbington 2012; Perrault 2013; Urkidi & Walter 2011). The rising frequency and severity of mine-community conflicts is now recognised as a significant business risk for multinational mining companies (Franks et al 2014; Hodge 2014). This has generated increased attention to means of conflict mitigation and improving community relations in contexts of weak institutions. Forms of corporate-social responsibility, community development initiatives and stakeholder engagement see mining companies taking on quasi-governmental roles to address this in areas where state presence is limited and public services inadequate (Campbell 2012; Hilson 2012; Kemp et al 2011; Harvey 2014; Rajak 2011; Franks et al 2014). Whether such initiatives create peaceful and developmentally beneficial mine-community relations depends on multiple mediating factors. These include local expectations of the developmental role of mining companies (Bebbington 2008; Frederiksen 2017), and the institutional context at local and national levels (Thorp et al 2012; Bridge & Jonas 2002). Besides distributional injustices and perceptions thereof, questions of procedural and interactional justice are additionally important factors (Kemp et al 2011).

There has been relatively little consideration in this literature of how shifts in the materiality of mining practices and the differing labour and capital intensity of mining business models interact with these socio-political factors (though see Himley 2013). In particular relating to the question concerning this paper, of the socio-political causes and consequences of shifts towards greater mechanization of industrial mining in a developing country context. Such issues have received more attention in economic development literature, where the ‘enclave’ nature of capital-intensive industrial mining with limited local economic multipliers, and the negative implications thereof for economic growth and diversification, are longstanding concerns (e.g. Singer 1950; Morris et al 2012; Jourdan, 2014; UNECA, 2011). Attention to the developmental consequences of technological upgrading has also been a particular concern of artisanal mining scholars, since formalisation initiatives frequently involve increased mechanisation which reduces labour intensity with consequences for livelihoods (Verbrugge & Besmanosc 2016; Saldarriaga-Isazaa et al 2013; Hilson et al 2016)

It is important, we argue, to pay greater attention to such issues of technological and operational change in industrial mining in developing country contexts also. Changing demands for labour from mining operations, in terms of both numbers of workers and skill levels, matters not simply for labour relations but also for mine-community relations. Contests over the distribution of risks and benefits are key drivers of mine-community conflicts (Kemp et al 2011; Bebbington 2008; Bridge 2004), and within such contests direct employment opportunities for locals vis-a-vis workers from outside the mining locality often feature centrally (see Frederiksen 2017; Kemp & Owen 2013, 100; Himley 2013; Van Alstine & Afionis 2013; Gilberthorpe & Banks 2012; Smith & Dorward 2013). Employment is a crucial means by which mining activity may deliver local benefits, with mining companies frequently being the only large-scale, modern, formal employer in regions defined by

precarious informal or agrarian livelihoods. Even in the presence of extensive non-employment-based redistributive mechanisms – such as royalties or CSR expenditure on amenities and infrastructure – direct employment continues to be highly sought after among mining communities (*Ibid*). Tension around this matter commonly arises because industrial mining has employee skill requirements which may preclude most locals, while in-migration of labour can create additional pressures over land and other resources (Gamut et al 2015, 168; Van Alstine & Afionis 2013, 366-370; Gilberthorpe & Banks 2012, 189-191; Smith and Dorward 2014, 32; Frederiksen 2017, 15; Garvin et al 2009, 579; Kamlongera, 2013).

In situations where mining operations not only fail to provide significant employment opportunities for locals but also disrupt existing livelihoods, mine-community relations are particularly fractious. As Bebbington et al (2008) noted, this was a feature of extractive industry expansion into new rural geographies during the 2000s boom. The struggles elicited were ‘frequently over the meaning of development rather than simply over the distribution of rent’ with participants often ‘arguing that extraction should simply not occur in a particular place, or even not at all’ (*Ibid*, 901). Such protests are better understood as ‘defensive responses to accumulation through dispossession rather than accumulation by exploitation’ as in conventional labour-capital conflicts in mining (*Ibid*, 903).

Such shifts in the nexus of mining-related tensions are an outcome of transitions between what Ferguson (2006) conceptualised as socially ‘thick’ and ‘thin’ variants of the extractive industry in Africa. The ideal-type for former is the labour-intensive Zambian copper mining industry of pre-privatisation ZCCM, dependent on a unionised and politically influential workforce and paternalistically engaged in local systems of social reproduction (*Ibid*, 197).

The latter's ideal-type is the Angolan offshore oil industry, with a small number of well-paid and primarily foreign staff running capital-intensive operations using imported goods and equipment (*Ibid*, 198-199). Maintaining these enclaved operations in contexts of extreme local poverty was frequently dependent, Ferguson observed, on heavy security, but had appeal to multinationals seeking to avoid complex local political entanglements. In South African PGM mining intense labour conflict (see Chinguno 2015; Sinwell 2015; Capps 2015) rising production costs and multiplying distributional pressures from government and communities have led companies to seek a more 'socially thin' operating model through mechanisation. The following sections outline the causes of this transition, and its likely consequences for mine-community relations.

3: PGM mining after Apartheid: state-driven attempts at social thickening

Throughout the colonial and apartheid periods, the South African state employed administrative measures that institutionalised deep racial inequality. In mining, this involved preventing black ownership of mineral wealth alongside engineered land scarcity which created the migrant labour system (Beinart 2001, 155-164). Control of migrant workers from impoverished South African ethnic homelands and neighbouring countries was maintained through ethnically-segregated worker hostels – separate from local communities – and restrictions on personal and political freedoms (Bezuidenhout & Buhlungu 2010, 244-247; Forrest 2014). Cheap black labour alongside challenging geology resulted in a highly labour intensive business model for gold and PGM mining in particular, using physically arduous and dangerous drilling-and-blasting methods (Stewart, 2015: 634-636). While labour intensive, this was a 'socially thin' model in which the mining company was enclaved from host communities, with negligible developmental obligations.

In the post-apartheid period, government, trade unions and civil society have introduced a range of new distributive pressures, seeking to improve wages, working conditions and developmental contributions to mining communities. New legislation in the 1995 Labour Relations Act, 1996 Mine Health and Safety Act, 1997 Basic Conditions of Employment Act, and 1998 Employment Equity Act, entrenched union freedoms, set minimum standards in areas like working hours and leave, and forced companies to pursue affirmative action. The landmark post-apartheid mining legislation, the Minerals and Petroleum Resources Development Act (MPRDA) 2002 nationalised mineral resources and introduced a licensing system requiring companies to meet targets for developmental contribution and historical redress in the 2004 Mining Charter (updated in subsequent iterations). These covered deracialisation of management, preferential procurement and transfer of 26% equity-equivalent ownership to black-economic empowerment (BEE) partners (Department of Minerals and Energy, 2004). It also required government-approved five-year Social and Labour Plans (SLP) outlining developmental commitments to the workforce and adjacent communities (*Ibid*).

The dissolution of the migrant labour and hostel system resulted in workers becoming resident in mining communities, generally in informal settlements which expanded rapidly as PGM employment grew from just under 100,000 in 2000 to over 200,000 in 2008 (Bezuidenhout and Buhlungu, 2015). As such, workers faced multiple living costs previously provided for by hostels. Companies therefore introduced 'living-out allowances' on top of wages. However, with multiple dependents, high basic-goods' inflation and a low 'social wage' due to the severe inadequacies of municipal service delivery, there has been continued

upward-pressure on wages and discontent over living conditions (Makgetla & Levin, 2016). This is manifested in labour costs. During most apartheid decades, wages barely increased above inflation, the important exception being the 1970s (see Forrest, 2014: 152). After the democratic transition, unionised workers secured above-inflation increases in the 1990s and 2000s (Table 1) (Bowman & Isaacs 2015). Average PGM mining remuneration increased, in real terms, from R6,000 per-month in 1992, to R16,000 per-month in 2014. These increases are similar to other mining sectors, but contrast sharply with the wider economy where sectors such as manufacturing, construction and agriculture saw more modest increases (Figure 1) (Finn 2015). While PGM wages remain generally lower than other mining sectors, the increases have greater financial impact since labour tends to account for a far larger proportion of on-mine production costs, typically half in conventional mining methods (Bowman 2016).

	Gold	Platinum
1950-1960	2%	NA
1960-1970	8%	NA
1970-1979	84%	NA
1982-1992	-0.15%	-0.5%
1992-2002	62%	41%
2002-2012	72%	104%

Table 1: Real decadal wage inflation in gold and platinum mining

Source: DMR, Department of Mines; author's calculations.

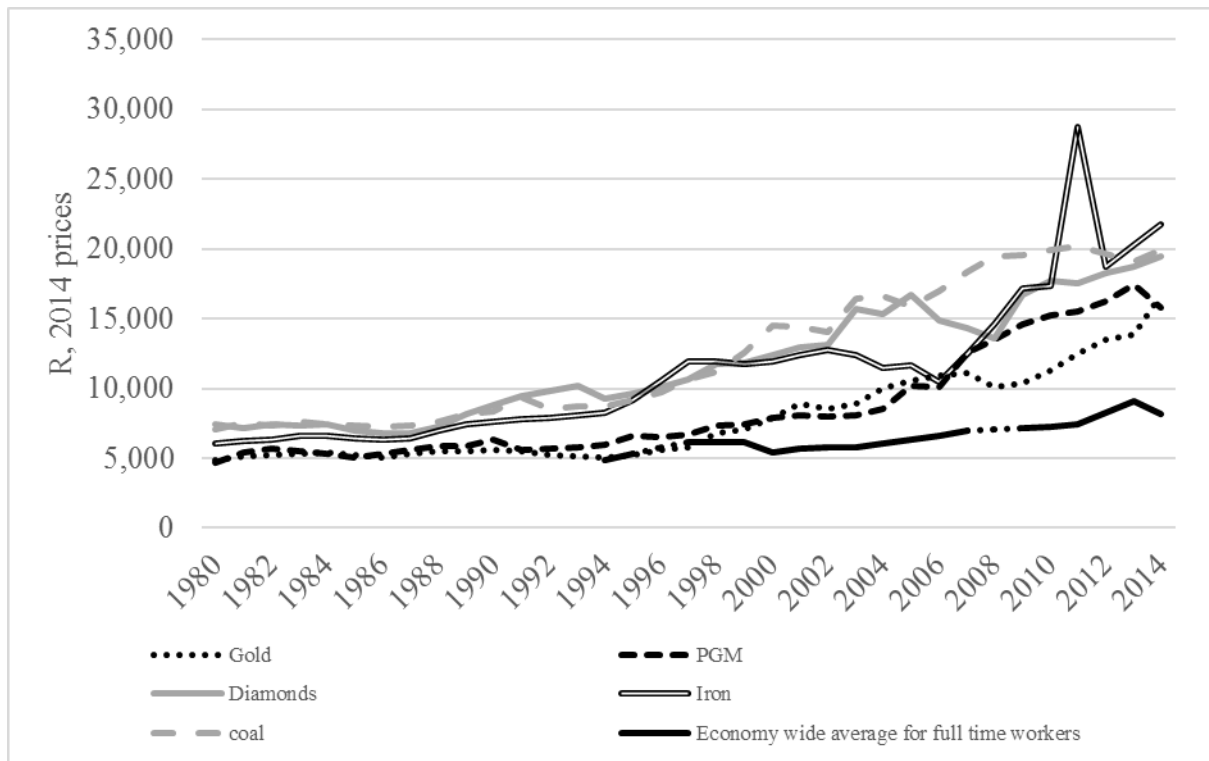


Figure 2: average monthly wages by sector (R, 2014 prices)

Source: DMR; PALMS; author's calculations

Beneath these averages are stark inequalities, particularly in the widespread use of low-wage contract labour (Bowman 2016; Forrest 2014). Nonetheless, in aggregate the result has been escalating labour costs in a business model predicated on tight control of this variable. This has combined with declining productivity. As sector employment doubled between 2000-2008, kilograms of PGM per employee fell back 40% to 1.4 kilograms.⁵ Simultaneously, the labour cost per-kilogram trebled in a decade (Figure 2).

⁵ Author's calculations from DMR data

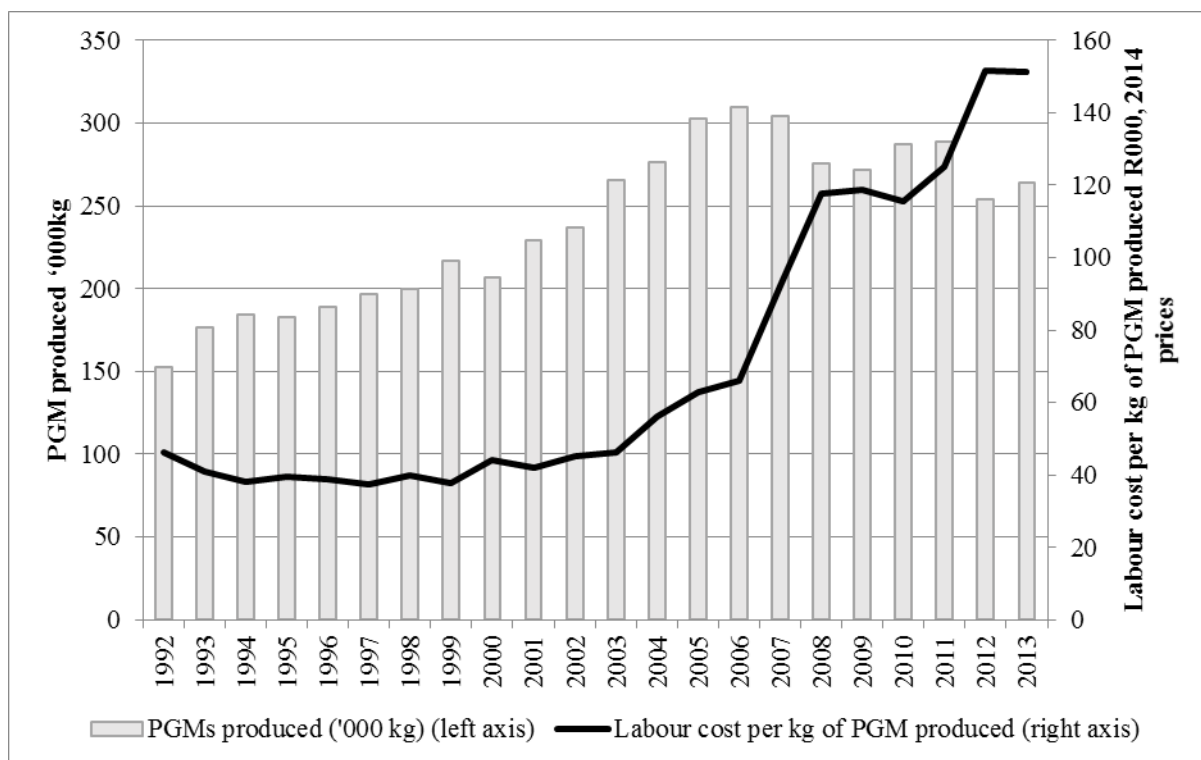


Figure 3: PGM production (kg000) and labour cost per kg of PGM produced (R000, 2014 prices)

Source: DMR data; author's calculations

In the early 2000s PGM mine labour was still considered low-cost by investment analysts, with companies achieving high profit-margins. Subsequent cost-increases – including material inputs and electricity – were masked by rising metal prices. This encouraged persistence with conventional labour-intensive mining, with a strategic focus on rapid output growth over cost control. However, from 2009 the sector suffered persistent low profitability as continued rising costs met falling metal prices: platinum prices fell from a 2008 peak of \$2,000/oz to \$1,400/oz in 2014, and since 2015 has hovered around \$1,000/oz. Coinciding with this squeeze on profits has been instances of severe labour conflict, with trade unions arguing that arduous and dangerous underground mining is underpaid and that workers suffer

poor living conditions in informal settlements that are inadequately compensated for by living out allowances. Added to this has been intense inter-union competition.

After relative stability in the 2000s under the hegemony of the ANC-aligned National Union of Mineworkers (NUM), labour conflict ignited in 2011/12 as the challenger Association of Mineworkers and Construction Union (AMCU) amalgamated militant workers' committees demanding a R12,500 'living wage' (Sinwell, 2015; Chinguno, 2015). Violence between AMCU, NUM, mine security and police culminated in the latter's massacre of 34 striking mineworkers from Lonmin, then the world's third largest platinum producer.⁶ The ensuing political controversy and Commission of Enquiry (Marikana Commission of Enquiry 2014) focused attention on the sector's harsh working and living conditions (Alexander 2013; Alexander et al 2012; Amnesty International, 2016). Tensions flared again in 2014 wage negotiations, with a five-month strike over the R12,500 wage demand, the longest in South African history. This again made PGM mining an object of international political controversy, with negative implications for buyer and investor risk perceptions.

Alongside labour conflict, the labour-intensive business model has also generated tensions in mining communities. PGM deposits predominantly lie beneath densely populated rural communal land in North West and Limpopo provinces' former Homeland areas under jurisdiction of several traditional – 'tribal' – authorities. Under apartheid, Homelands were used to contain the black population in over-crowded rural communities. The legacies of this system have endured in extreme poverty, high unemployment and a lack of basic services, creating an immensely complex social context for mining activity (Mnwana and Capps,

⁶ At the time of writing, Sibanye announced plans to purchase Lonmin.

2015). Into this, the PGM boom attracted large numbers of labour migrants from across South Africa and the region. Indeed, the city of Rustenburg, PGM mining's heartland, was South Africa's fastest-growing urban area post-apartheid, with the population increasing over 400% to nearly 400,000 between 1995-2015.⁷ The doubling of the sector's workforce to 200,000 in the decade to 2008, alongside the reduced role of mine hostel accommodation, resulted in the proliferation of informal settlements in already land-constrained areas (Makgetla & Levin 2016). This intensified demands on infrastructure and social services, and inflamed ethnic tensions, with negative implications for social stability and mine-community relations (Mnwana 2015a, Mnwana 2015b, Mnwana, Mtero & Hay 2016).

These issues are reflected at Amplats'⁸ Union Mine in the Bakgatla-ba-Kgafela traditional authority area, formerly part of the Bophuthatswana homeland. One of the oldest platinum mining operations in South Africa, it is an archetype conventional labour-intensive PGM operation. Much of the mine's land is categorised as tribal property, owned by the Bakgatla community.⁹ The village of Sefikile adjacent to the mine is one of 32 under the authority of Kgosi (Chief) Nyalala Pilane, and has experienced severe strains from inward migration. In line with the sectoral trend, the Union mine's workforce almost doubled in a decade, from 6,000 in 1997 to a peak of 11,000 in 2007.¹⁰ During apartheid, mineworkers were predominantly housed within a fenced enclave, with white staff in supervisory and managerial roles occupying suburban-style bungalows with their families, and black workers housed in single-sex hostels with tightly restricted freedom of movement. However, with

⁷ Author's calculations from United Nations, Department of Economic and Social Affairs, Population Division (2014). World Urbanization Prospects: The 2014 Revision.

⁸ Until 2017, the Union mine was owned by Amplats, before being sold to Siyanda Resources – a transaction that has yet to be completed at the time of writing.

⁹ Although the state (Minister of Rural Development and Land Affairs) holds the title on behalf of the community.

¹⁰ Data from company annual reports.

present-day mineworkers almost entirely opting to leave hostels and receive the living out allowance, the growing workforce, along with accompanying families and service sector workers, shifted to informal settlements which proliferated around the edges of the village.

This was a major source of community tensions when fieldwork was conducted. With the majority of the established population living in small homesteads with poorly-built iron shacks, this created extreme overcrowding and exacerbated pressures on already minimal public services of health and education (See Mnwana, 2015). Additionally, growth of informal settlements around the village also resulted in reductions in agricultural land, restricting livelihood options. Villagers previously using land for arable farming were compelled to cease ploughing. These pressures generated ethnic tensions between the local Tswana population and incomers. Indeed, the main informal settlement of Kwecheza was nicknamed by its inhabitants 'Thula Mtswana', isiXhosa for 'shut up Tswana'. When this study was conducted it contained no public services except for a few communal taps and pit latrines, with no roads, electricity, health care centres, or school.

Amplats' responded to these pressures with conventional CSR initiatives aimed at augmenting public services, and a royalty-to-equity conversion with the Bakgatla tribal authority. As discussed above, post-apartheid mining legislation sought to increase mining companies' contribution to community development and historic redress through the Mining Charter. This process intersected with the 'retribalisation' of former homeland areas, as legislation from early 2000s enhanced tribal authority powers: in particular, the Traditional Leadership and Governance Framework Act of 2003, re-enacted traditional (tribal) authorities to preside over the same geographic areas defined by the apartheid government,

and endowed chiefs and their traditional councils with powers over the administration of land, natural resources, economic development, health, welfare, and administration of justice. Mining operations across the PGM sector have sought to engage tribal authorities as BEE partners for equity ownership transfer and procurement requirements, alongside local social and developmental initiatives. Indeed, weighted by value 46% of PGM BEE-ownership transactions have been with ‘communities’, predominantly tribal authorities, compared to 29% for the mining industry aggregated (COM 2015).

In many cases, this has involved conversion of existing royalty payments for land access into equity shareholdings which contribute to attainment of the BEE ownership requirements (see Mnwana, 2015; Manson and Mbenga, 2014; Capps and Malindi, 2017). This compares to the conventional approach to BEE which is to sell shares to BEE entrepreneurs, using commercial and vendor debt-financing. For mining companies, the appeal of tribal authorities as BEE partners is securing access to land and stabilisation of the local operating environment. Chiefs offer a potential buffer against the complex social pressures generated by conventional labour-intensive PGM mining discussed above, as mediators of mine-community relations with control over revenues, access to local procurement opportunities and de-facto labour brokers for mining jobs (Manson and Mbenga 2013; Mnwana and Capps 2015; Mnwana 2015).

In practice mediation by traditional authorities has not proven consistently effective in this regard. In many high-profile cases, this has instead been a catalyst of mine-community conflict. Tribal authority has frequently been contested and chiefly authority resisted by those disputing lineages and historical claims to land ownership (Mnwana and Capps 2015;

Mnwana 2016). In some cases, contestation also stems from allegations of corrupt misuse of mineral revenues, or abuse of power in controlling access to mining jobs and procurement opportunities (Mnwana 2014b). Power struggles among local elites have become inseparable from contestation of resources. Rather than a mediating role in mine-community relations, in worst cases tribal authorities represent elite capture, fulfilling enforcement functions and deploying repressive apparatus to clear former agricultural land (Mnwana 2016:222).

This is exemplified by the Bakgatla-ba-Kgafela chieftaincy around the Union mine, which in 2006 took a R420m commercial loan and agreed to convert a pre-existing royalty to purchase a 15% share in Amplats' subsidiary. Claims the transaction was endorsed by community members (Amplats, 2006) were disputed by many community members, while allegations of corruption in the use of subsequent mining dividend income and restriction of employment and procurement opportunities to the politically compliant have dogged the chieftaincy and elicited protest (Mnwana, 2015). To differing extents, similar disputes have swirled around the Bafokeng, Bapo and Bakubung chieftaincies on the platinum belt (See Manson & Mbenga, 2014; Capps & Malindi, 2017), supporting mounting criticism of post-apartheid mining legislation for promoting chiefly accumulation at the expense of ordinary rural residents (Claassens and Matlala 2014:116).

PGM mining companies also engage in more conventional CSR practices, with service delivery functions for employees and community members contributing to fulfilment of the aforementioned SLPs. However, as Rajak demonstrates, PGM mining companies also used CSR to augment their political capital: for companies severely tainted by apartheid legacies and the social problems discussed above, CSR became a 'vehicle for the company's

projection of its role as a key collaborator in the new South Africa' (Rajak 2011, 108). As with engagement of tribal authorities as mediators of mine community relations, these activities have proven inadequate in ameliorating mine-community tensions and improving image and political legitimacy. Company CSR performance has been criticised by trade unions, influential civil society organisations and the DMR for inadequacy and lack of implementation relative to the scale and extent of social problems in informal settlements (Centre for Applied Legal Studies, 2017; Makgetla and Levin, 2016; Bench Marks Foundation, 2008, 2014 & 2016). Such criticisms were also levelled by the Marikana Commission of Enquiry, which concluded that mineworkers' abysmal living conditions and Lonmin's failure to meet SLP housing targets 'created an environment conducive to the creation of tension' (Marikana Commission of Enquiry, 2014: 522-542).

In sum, while undergoing an attempted process of state-driven 'social thickening' in terms of interconnections with local communities in mining areas and the empowerment of workers, this has not resulted in more stable labour or mine-community relations. Instead, due to the continued marginalisation of the rural poor in a situation of elite capture of redistributive processes, the limitations of CSR practice, and the growth of informal settlements as the industry has simultaneously expanded and reduced its use of worker hostels, mining companies have faced increased mine-community tensions. At the same time, rising labour costs, declining labour productivity, falling PGM prices and the emergence of more radical trade union politics has both generated labour conflict and undermined the financial viability of conventional labour intensive business models. These factors have increased the impetus for a shift to greater mechanisation. As discussed in the following section, the appeal is not simply the potential to improve profitability, but also the expectation that the shift might improve the sector's severely tarnished socio-political legitimacy, by removing the problems

of labour conflict, hazardous working conditions, and large informal settlements described above.

4: Escape to the enclaves? The pursuit of mechanisation in platinum mining

Writing in 2015, Amplats Chairperson Valli Moosa, stated ‘South African society does not have sympathy for a business model which is based on low skills and low wages, extremely hard work in potentially hazardous conditions, and the migrant labour system’ (Amplats 2015b, 13). The statement came after the labour and community conflicts described in the preceding section, and amid a restructuring of Amplats’ mining portfolio towards becoming, eventually, a wholly mechanised mining company in which human labour is removed from the mine face and replaced by vehicles (ThomsonReuters 2014). The company sold the Union Mine discussed above, alongside its historically-dominant Rustenburg mines. This removed 50% of the workforce for a loss of only 20% of metal produced (RBC Capital Markets 2015). As reflected in Moosa’s statement, the rationales for this shift has been socio-political as well as financial: an effort to escape the dense and complex social entanglements associated with the conventional labour intensive business model. New entrants, established competitors and government have now adopted these rationales for the necessity of increased mechanisation. The financial rationales can be illustrated using financial data from Amplats’ annual reports and accounts. Throughout the industry’s recent crisis a small number of highly mechanised mines, representing less than 20% of mined production, have remained profitable through low operating costs. These are predominantly on the Bushveld Complex’s less developed northern and eastern limbs in the former Lebowa homeland, and in Zimbabwe. Deposits there tend to be shallower – with average Western Limb mines 800m deep, compared to 400m on the Eastern Limb, and less than 300m in Zimbabwe (Credit Suisse 2012) – and as mines are

newer they can be designed around mechanised methods rather than expensively re-engineered. As Table 2 derived from a recent Amplats report shows, conventional mines have 60% of on-mine cost-base taken up by labour, compared to 40% in mechanised mines and less than 20% in an open-cast model.

% of costs	Labour	Stores	Utilities	Contractors	Other
Conventional	62	17	8	3	10
Mechanised	38	24	3	25	10
Opencast	19	51	12	5	13

Table 2. Amplats cash operating costs by mining method

Source: Annual report, 2016

The latter refers to Amplats' large Mogalakwena mine in Limpopo province, on northern limb of the Bushveld Complex, the least developed platinum mining area. In 2013, the last year Amplats' published comparable data, its Rustenburg and Union mines' 23,000 workers produced an average of 43oz PGM per-employee, compared to 346oz/employee from Mogalakwena's 2,125 employees (Amplats 2014). As Figure 3 shows, having achieving similar levels of profitability in the early/mid 2000s, the mines diverge after 2007, with the labour-intensive Rustenburg and Union mines not recovering pre-crisis levels while Mogalakwena sustains consistently high margins.

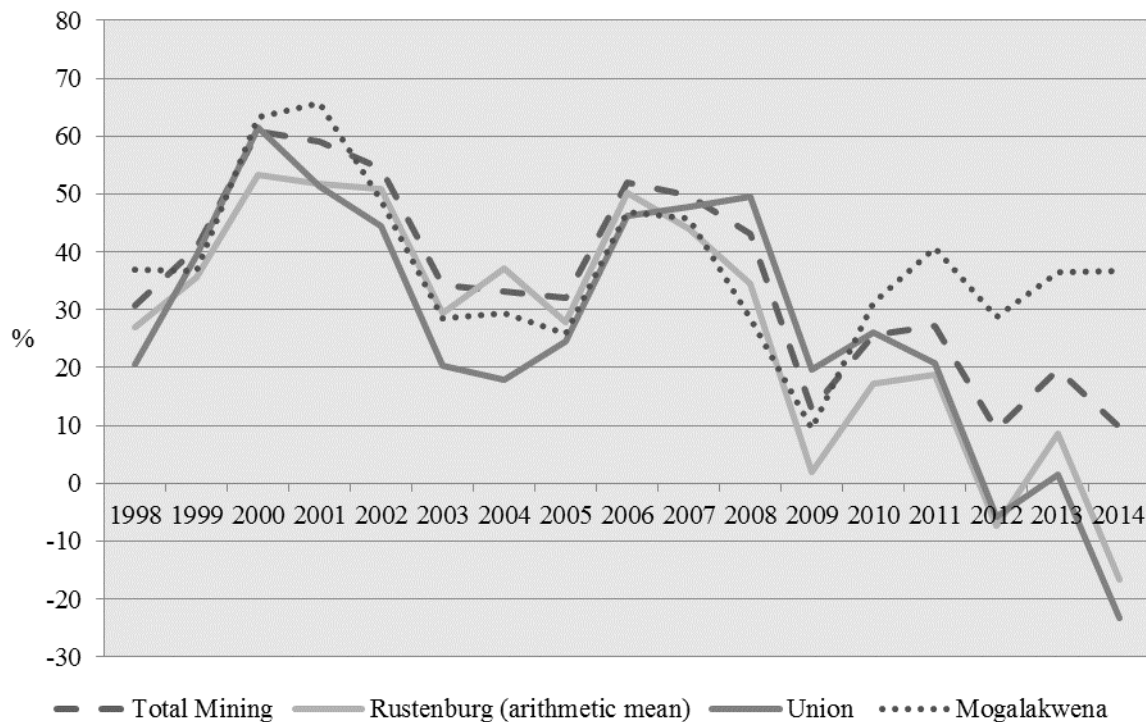


Figure 4: Operating profit margins at selected Amplats mines

Source: Amplats annual report and accounts, various years

With mining capital internationally mobile and multinationals under pressure to ration investment to projects with globally competitive rates of return. In 2014, Amplats' management committed to a group-level return on capital employed target of 15%, committing to deploy capital only to projects capable of meeting this target (Amplats 2015b, 9). Achieving this entailed 'transition to a lower-cost, more focused quality portfolio' attempting to grow 'higher margin and low-cost operations such as Mogalakwena' while selling the Rustenburg and Union mines (Amplats 2015b, 37). Since 2012 the former has consistently accounted for around 50% or more of the company's operating profits, but with less than 5% of the company's workforce, and from only one-fifth of PGM production (Table 3).

	PGM production	Employees	Mining operating profits
2007	7%	2%	8%
2008	8%	4%	6%
2009	11%	4%	11%
2010	12%	4%	21%
2011	14%	4%	32%
2012	15%	4%	71%
2013	16%	4%	47%
2014	21%	4%	130%
2015	NA	NA	83%
2016	NA	NA	65%

Table 3: Mogalakwena's contribution to Amplats

Source: Company annual reports, author's calculations

The socio-political rationales relate to the perceived potential of mechanised mining to reduce labour and mine-community conflict and in doing so restore the sector's stability and legitimacy of the industry. Compared to labour-intensive conventional mines such as Rustenburg and Union, Mogalakwena's workers are highly-paid and skilled operators of machinery. Reportable injuries per million man-hours worked are one at Mogalakwena compared to between four and nine at conventional mines.¹¹ The chief-executive of Ivanhoe Mines, working towards a 2020 commissioning for its large, mechanised Platreef project adjacent to Mogalakwena, said:

¹¹ Author's calculations from company annual reports.

Everyone working [at Platreef] will be in an air-conditioned cab and there will be no exploitation of human labour. It's the kind of mine operation where there will be no fatalities or injuries. The men and women who work here will be very well paid professionals who will lift nothing heavier than a pencil (Cloete, 2016).

The higher pay levels and lower labour requirements mean such operations are not envisaged to generate the large informal settlements associated with conventional Western Limb mines. This diminishes potential for the kind of tensions between in-migrants, locals and mining companies discussed in Section 3, and enables a more enclaved, socially-thin model without the dense social entanglements characteristic of conventional operations. In addition, the aforementioned trade union AMCU, dominant at most conventional labour-intensive mines, does not command significant support at mechanised operations. A shift toward greater mechanisation thereby offers a potential remedy to several of the key sources of mine-community conflict and labour conflict which have come to typify the South African PGM industry. Though Amplats' is best positioned to pursue such a strategy given the nature of its resource base and its comparative financial strengths, and Mogalakwena is a unique operation, the strategy has sector-wide appeal has become the established narrative on expectations for the sector's future. Investment from new entrants, notably the aforementioned Platreef project, also tends to target more easily mechanisable deposits, as emphasised in communications with investors (e.g. Ivanplats 2016).

By some estimates, 30% of platinum production is already fully or partially mechanised, with increased usage of partially mechanised drilling and blasting equipment in newer mines over recent years (Solomons 2015; Singh 2017). However, mechanisation of existing labour-intensive underground mines using conventional stoping techniques on the narrow UG2 and

Merensky reefs poses huge technical and economic challenges (Stewart 2015). Early trials found high capital-costs negated labour efficiencies (Rustenburg Platinum Holdings 1990, 6), and while conventional methods remained profitable mining companies took a conservative approach to innovation (Citigroup 2005; JPMorgan 2005). Anticipating the socio-economic problems discussed in Section 3 Lonmin, until recently the world's third-largest platinum producer, in the mid-2000s attempted an ambitious transition to 50% mechanised production (Lonmin 2006, 12). This involved construction of new mechanised shafts and re-engineering existing ones. The programme suffered multiple technical problems and expected cost-reductions were not realised. In 2008, mechanised production costs were double conventional methods (Lonmin 2008, 12-13). The programme was abandoned, entrenching the path-dependency of conventional labour-intensive mining. In recent years the company has faced severe financial difficulties, requiring several share issues. Management suggest its long-term prospects lie with un-developed, easily mechanisable projects on the northern limb (Lonmin 2016, 11). Similarly, Implats, the world's second-largest PGM producer, has announced a long-term strategic shift focus to shallower ore-bodies and has purchased new mining assets on the northern limb (Implats 2017, 43-44; Secombe 2017).

Government approaches to the transition are ambiguous, with support for the sector's mechanisation efforts limited and inconsistent. This reflects broader inconsistencies in economic policy which have resulted from increased factional fragmentation within the ANC (Bowman 2018). Indirectly, the DMR's more assertive approach to mine health and safety inspections in recent years, and increased willingness to use Section 54 Mine Health and Safety Act (1996) to halt operations when perceiving transgressions, has increased the impetus for mechanised mining methods which remove workers from the mine-face. Such stoppages are viewed as a significant cost to mining companies, with Lonmin in 2009, for

example, reporting 5% of annual production as lost to safety stoppages (Solomons 2016; Lonmin 2009, 6). Direct support for mechanisation as part of a broader modernisation drive, meanwhile, was a priority emerging from the 2015 multi-stakeholder Mining Phakisa, established to develop solutions to the industry's crises (Singh 2017). Research for the Phakisa estimated that mechanisation could extend PGM reserves from 303Mt using conventional methods to 763Mt, and 314Mt to 592Mt for gold (Turner 2016, 14). Government has subsequently indicated increased commitments for support and collaboration in R&D to further innovation in the mechanisation of gold and PGM mines, for example in non-explosive rock breaking technologies (CSIR, 2016). The aim is that output-growth and jobs created in mining capital goods value chains can offset job losses to mechanisation given appropriate industrial policy support, an approach also supported by the Department of Science and Technology and Department of Trade and Industry (Singh, 2017; DTI 2017).

However, these nascent forms of industrial policy collaboration have taken place in a context of a severe deterioration in state-business relations over the DMR's third iteration of the Mining Charter, and 'state capture' corruption allegations which have engulfed the Zuma administration and involved the Mineral Resources Minister (Bowman 2018; Swiling et al 2017). Additionally, in a context of continued high unemployment – almost 28% by its narrow definition in the first-quarter 2017¹² – and declining employment in mining specifically since 2012, major mine redundancies are unlikely to be without political controversy. Indeed, Amplats' previous plans to make 14,000 redundancies at its labour-intensive mines as part of its attempt to re-orientate towards lower-cost, mechanised production in 2012/13, were substantially moderated after pressure from the DMR (JPMorgan 2013). In addition to the quantity of jobs created, the nature of the jobs created by

¹² StatsSA, Quarterly Labour Force Survey – QLFS Q1:2017.

a shift to mechanised mining is an important additional factor with social implications. While jobs in mechanised mining are higher-paid and safer than in conventional business models, they also require higher levels of formal education and training. In the event of a successful industrial policy effort that creates new jobs in value chains for mining capital goods to replace jobs lost in mining itself, these will not, in most cases, be in the direct vicinity of the mine itself where the major impacts of the activity are felt. Therefore, as the next section details, the outcomes for mine-community relations may be more complex than envisaged since the increasingly socially-thin nature of more mechanised operations can be generative of different forms of tension.

5: Redistributive struggles after mechanisation

This section discusses ethnographic research findings from communities surrounding the aforementioned Mogalakwena mine to provide insight into the consequences of increased mine mechanisation in the South African context. As mentioned above, the mine is located in a rural area of Limpopo province in the former Lebowa homeland, now the Langa-Mapela tribal authority area. As with most former-homeland areas, the region suffers high poverty-levels and population density, inadequate basic infrastructure, and low formal-sector employment (Neves & du Toit 2013). Minerals prospecting has a long history in the area, but largescale mining began only in 1993. As in many instances with PGM mining, land access required a surface lease agreement with the tribal authority. Alongside its 137 km² mineral-right area this gave Amplats' 'exclusive rights' over the leased land 'for the remaining economic life of the mine', in return for a lump-sum rental payment of R1.2m and an annual rental of R5,000 escalating by 10% per-year (Amplats 2008, 10). These figures were 'based on the agricultural potential of the land', and at 1993 exchange-rates amounted to

US\$480,000 and US\$2,000 respectively. This compares to Mogalakwena's 2016 net sales revenue of R14bn (~US\$1bn).

The thickness and shallowness of the reef allows open-cast mining, which facilitates mechanisation but requires large amounts of land. Expansion to a third pit between 2006-2015 involved relocating thousands of villagers. During fieldwork in 2015-2016, many households had lost access to land and other natural resources as a result, with surveys suggesting negative implications for livelihoods derived from enclosures of arable and grazing land, and relocation to land villagers saw as less fertile (Mtero 2017). Respondents broadly claimed harvests has been depleted. As one male farmer explained:

The size of land I used to have has been extremely reduced by the mine. As a result, I only cultivate three out of the fifteen hectares that I originally had. I pay the owner of the tractor people R600 to cultivate the three hectares at R200 per hectare. Last year I harvested only three small bags of sorghum. As we speak, there is none left in the storage. It has all been finished. (Interview: Ga-Chaba/Mokopane.31.03.2015).

This collision between mining expansion and pre-existing rural livelihoods is starkly represented by the clusters of homesteads dotted along the edges of mine-dumps, where residents continue forms of subsistence agriculture. Residents complained of impacts on water sources, and dust and building damage from blasting. In addition to economic impacts, major grievances related to lost cultural and spiritual heritage sites – particularly graves.

As a land-based activity, displacement and environmental externalities are a near-inevitable companion of industrial mining. Here, though, these processes occur without the mitigation

of mass employment to provide alternative livelihood opportunities and local economic multipliers. The mine does directly employ over 2,000 people, but most jobs require skills and education precluding much of the immediate affected community. Workers travel to the mine from nearby Mokopane, a former whites-only town with modern amenities for higher-income workers. Meanwhile, unemployed youth throng outside the mine entrance daily seeking employment. Lack of expected job opportunities from the mine was a widespread grievance expressed in interviews. As one young jobseeker put it:

When the mine first came and presented their relocation vision and promises to us, I was genuinely impressed. They talked about how they would take the youth away from the streets through employment and educational opportunities. The mine is yet to fulfil any of these promises (INT.8.Ga-Sekhaolelo/Mokopane 08.04.2015)

When asked to comment about the mine's local recruitment strategy *Kgoshi* Langa also concurred:

To a large extent the problem with this mine [Mogalakwena] is that it is mechanised. It is not labour intensive. People get employed on contracts but for permanent jobs are few. For the mine to employ them [local people] they must have maths and science. So those who don't have maths and science feel that they are being marginalised. (Interview, Kgoshi K. D. Langa.10.06.2015)

In an explosive combination economic enclavity combines with dispossession, eliciting multiple forms of mine-community conflict: 'illegal' land occupation and cultivation within the mineral rights area, refusal to relocate and, since 2013, violent collective protests over livelihood-related demands, including compensation for land-losses, youth employment opportunities and allegations of hiring non-local workers. Some protests disrupted mine

operations and damaged infrastructure, notably a prolonged 2015 shutdown (Amplats 2015c). Consequently, the mine has become increasingly securitised, with mine buildings and access routes inaccessible and security personnel at the entrance engaging with outsiders through thick bulletproof glass windows.

Increased conventional security has, however, been inadequate to secure a stable operating environment, and so Amplats have resorted to familiar tools in using tribal authorities as mediators. Following earlier interventions by the central government's Minister of Mineral Resources and the South African Human Rights Commission (Amplats 2016c, 10), a March 2016 'settlement agreement' between the company and the Mapela Kgoshi David Langa, involved an R175m payment of to a community development trust chaired by Langa, with other community representatives appointed as trustees, modelled on the corporate structure used by the Royal Bafokeng Nation to manage its mineral revenues (Amplats 2016a). However, in patterns familiar from other instances in which tribal authorities have been used in this fashion, some community members claim the deal was struck without proper consultation and centralises control of community-owned mining revenues in Langa's hands. There has been considerable protest against the settlement agreement (amaBhungane 2016; ActionAid 2016). Similarly, more conventional community agriculture CSR projects were destroyed by protesters (Amplats 2016b). At the time of writing, this contestation meant the agreement was still on hold. Amplats management have condemned the protests, suggesting they are motivated by opportunistic efforts to control revenues (Stoddard 2016).

5: Discussion and Conclusions

Drawing on case study material from PGMs, this article has examined the pressures for a shift toward mechanised production in the South African mining industry and its socio-political consequences. As the article showed, the labour-intensive conventional business model has been undermined by a combination of rising costs, declining productivity and multiple social problems accompanying a large, low-wage, low-skilled and unionised workforce, living in squalid conditions in informal settlements which have expanded in mining areas over recent decades. Accompanying this, the South African state has used legislation to drive a process of attempted ‘social thickening’, extending the obligations of mining companies to their workforces and host communities. These multiple, overlapping distributional pressures have influenced corporate strategy, and increased the appeal of business models with smaller, more highly skilled workforces, most notably represented by Amplats’ flagship Mogalakwena mine. Other PGM and gold mining companies now seek to achieve similar transitions.

The consequences of this shift has wider significance for the extractive industries in South Africa and the rest of the continent. As in the South African PGM sector, the commodities boom led mining companies to focus on output expansion as a primary aim, with investment flooding into conventionally labour intensive models in the search for growth (EY 2015; McKinsey 2017). However, the prolonged commodity price slump – with its attendant pressures for productivity enhancements – is now driving the search for radical technological innovation to minimise labour costs and other over-heads (Ross, 2015; Njini, 2013). This sits uneasily with increased expectations from many African governments – including the South African government – and host communities for mining companies to make a larger direct developmental contribution. These have manifested in recent years in higher local content requirements, local equity ownership obligations and employment quotas (Hansen et al 2016;

Childs 2016; Andreasson 2015; Roberts 2015). In the South African case in particular, the issues surrounding mechanisation reflect broader social tensions and the complex character of state-business relations. While some actors within the South African state have sought to support mechanisation efforts through R&D and industrial policy support, this comes amid a more general decline in state-business relations in mining which hampers such initiatives.

As the article has argued, given the context of high unemployment and inequality, the wider shift toward mechanisation may relieve some labour, community and state-business tensions, but will likely create new ones. As Bebbington et al (2008) have argued the expansion of the mining industry into new territories, in particular in areas where it has disrupted rural livelihoods, has been accompanied by new forms of protest. As they observe, '[t]hese struggles are frequently over the meaning of development rather than simply over the distribution of rent, and the actors involved assume more hostile positions vis-à-vis mining, arguing that extraction should simply not occur in a particular place, or even not at all' (*Ibid*: 901). These observations are pertinent with regard to the precarious and unstable social landscape around Mogalakwena. The 'social thinning' of the mechanised mining model meant that the land dispossession and environmental externalities accompanying mining have not been compensated for by mass employment opportunities for locals. As per Bebbington et al's terminology, the nexus of conflict has thereby shifted from the labour-capital relation to the mine-community relation. Attempts to mitigate these tensions by the mining industry will then in turn rely on the effectiveness of the redistributive policy framework and CSR initiatives. This will inevitably be challenging since, as Rajak observes in her study of CSR in the South African platinum industry, CSR practices 'serve to exclude large sections of society while demarcating a select target zone of responsibility (the 'community') which is bound into relations of corporate patronage and clientelism' (Rajak, 2011: 223). The 'geographies of

inclusion and exclusion' (*Ibid*) thereby created, may in themselves heighten contestation and community conflict rather than resolve them – a situation apparent at Mogalakwena and elsewhere in the platinum industry. Attempts by industry and government in South Africa to use tribal authorities as mediators between communities and mining companies in the allocation of mineral revenues and the management of local development initiatives have not resolved these tensions. Instead, such efforts produce conflict at community level, centred on accusations of elite capture and struggles over who legitimately represents mining communities.

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